

[0054] FIGS. 16a and 16b represent isofocal curvature maps obtained with resist calculation and aerial image calculation. These maps illustrate opposite isofocal behaviors within the illuminator.

[0055] FIG. 17 represents a contour map showing opposite isofocal behavior. This graph indicates what the best illumination arrangement would be for the specific pattern studied (90 nm holes / 360 nm pitch)

[0056] FIG. 18 shows the variation of the CD as a function of defocus for several exposure energies after optimization of the illumination conditions.

[0057] FIG. 19a represents a contour map illustrating the contribution of each source point located in the illuminator to the maximum exposure latitude max-EL.

[0058] FIG. 19b represents a contour map illustrating the contribution of each source point located in the illuminator to the dose-to-size E1:1.

[0059] FIG. 20 represents an illumination arrangement at the pupil plane of the illuminator. This arrangement combines information related to isofocal compensation, exposure latitude and dose-to-size.

[0060] FIG. 21 shows a focus exposure matrix obtained with the illumination arrangement shown in FIG. 20.

[0061] FIG. 22 shows the exposure latitude obtained with the illumination arrangement shown in FIG. 20.

[0062] FIG. 23 shows the variation of the exposure latitude with defocus for different illumination conditions.

[0063] FIGS. 24a-d represent, respectively, simulation results obtained for the exposure latitude, depth of focus, depth of focus at 8% of the exposure latitude and the isofocal curvature. The lithographic pattern corresponds to 75 nm holes located in 400 nm pitch.

[0064] FIG. 25a represents simulation results showing the variation of the depth of focus at 8% of the exposure latitude (DOF@8%EL) as a function of the pitch for different types of illumination arrangement, which are shown in FIGS. 25b and 25c. The lithographic pattern corresponds to 75nm holes.

[0065] FIG. 25b represents an illumination arrangement at the pupil plane of the illuminator. This arrangement combines information related to isofocal compensation, exposure latitude and dose-to-size. It has a $0.4\sigma + 0.90/0.4$ quasar illumination.